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ABSTRACT

A study examined programs and practices geared toward retraining middle-aged and older workers to cope with technological change. Literature pertaining to business and gerontology was reviewed, and interviews were conducted with managers responsible for the administration of 12 training and retraining programs across the country. Seven of the 12 programs examined were to be employer based. Generally, these programs were created for internal reasons associated with the immediate need to keep pace with the rapidly changing technologies of the given organization. Eligibility criteria for participation in the 12 programs appeared to have the potential for working for and against older workers; for example, years-of-service requirements favor older workers, whereas the administration of screening tests might place older workers at a disadvantage inasmuch as their education is less recent than that of their younger co-workers. All 12 programs combined the use of lectures with either simulation or on-the-job training to retrain workers. Managers of the employer-based programs noted that their training programs benefited their organizations in a number of ways. Each manager interviewed planned to continue their organization's existing training program, adapting it to meet new needs and populations. (Appended to this report are case illustrations of the 12 organizations examined.) (MN)

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Retraining the Older Worker for Changing Technology: Programs and Practices*

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Introduction

The quickening pace of technological change has sparked the nation's interest in training and retraining the American workforce. Concern over maintaining and increasing productivity has made retraining an important issue for business, particularly for those sectors of the economy where occupational skills can become rapidly obsolete. The need to assist workers whose jobs are eliminated by technological innovations is also encouraging some employers to look to retraining as a means of facilitating job transfers and worker relocations. Moreover, the recent growth of jobs in high technology industries has heightened the need to ensure an adequately trained workforce.

Much of the public interest in training and retraining efforts has been focused on youth and on young and middle-aged displaced workers. Relatively little attention has been paid to retraining policies and programs, particularly those in the private sector, designed to assist older and middle-aged workers affected by technological change in the workplace. Consequently, this exploratory study was conducted to examine issues related to retraining middle-aged and older workers for changing technology and to document the experiences of several organizations in providing such training. Of particular interest was the extent to which the actual practices of employers and other training organizations in training and retraining middle-aged and older workers were congruent with those reported and recommended in the literature.

Method

To examine the issues related to retraining middle-aged and older workers, literature from business and gerontology was reviewed, and interviews were conducted with managers responsible for the administration of twelve training and retraining programs. These case illustrations were selected from organizations identified in the business and popular press. All emphasized the preparation of workers for technological change and all actively involved older individuals. While these illustrations are typical of the kinds of technology related training and retraining programs currently being conducted by employers and other organizations across the country, they are not representative of all such efforts. (See the Appendix for a brief description of each case illustration.)

Six major questions guided the telephone interviews with program managers. These questions were: (1) Why are employers providing the types of technical training and retraining programs that currently exist? (2) What factors influence the participation of older persons in these programs? (3) How is the training or retraining specifically administered to participants? (4) What are the benefits of technology-based training and retraining? (5) What is the cost of training and retraining? and (6) What are the future directions to be taken by employers and other organizations in continuing to train and retrain persons for changing technology.

Program Characteristics

The technologies for which training was being provided in the case illustrations related to: space shuttle manufacture, numerically controlled machines, word processing, engineering, electronic office equipment

manufacture and repair, aircraft manufacture, robot maintenance and repair, computer programming, computer assisted design, micro-electronics, electronics/welding, and electronic communications switching. In three of the twelve case illustrations, training was provided solely by an employer. Employers and other providers, such as equipment manufacturers and educational institutions, were jointly involved in conducting training in an additional four case illustrations. Training was provided in the remaining five case illustrations by non-employer based training organizations including a for-profit contractor, a non-profit contractor, a trade school, an equipment manufacturer and a two-year educational institution. Three of the case illustrations involved pre-employment training whereas nine focused on training individuals who were already employed. The retraining offered in the employer-based programs tended to be on-going, involving the continual upgrading and updating of worker skills. In contrast, the training provided by the training organizations usually involved a one-time-only experience for the participants. Completion rates ranged from 80 to 100 percent. Managers attributed these high rates of success to careful screening procedures and an attitude of commitment on the part of participants. With regard to successful completion, older participants were described as doing as well as young participants.

While no single demographic profile of the trainees emerged, some similarities among the program participants were apparent. Decidedly more men than women were found in the programs; in only three of the case illustrations were the proportions of men and women approximately equal. As for the age breakdown of participants, managers generally responded that they did not keep track of this information; three of the programs, however, specifically targeted older individuals for their training efforts. A summary of selected characteristics of the case illustrations is provided in Chart I.

The major findings and conclusions that were drawn in relation to each of the six research questions are described below; related findings from the literature are also highlighted where appropriate.

Findings from the Case Illustrations

Employer Rationale

Generally, managers of the seven employer-based training and retraining programs reported that their programs were created for internal reasons, reasons associated with the immediate need to keep pace with the rapidly changing technology of their industries. The need to create changes in worker skills and, to a lesser extent, changes in worker knowledge were the most commonly given reasons for program initiation. One company developed its retraining program out of cost considerations, believing it less expensive to retrain its older engineers whose skills were becoming obsolete, than to hire younger, more up-to-date engineers. Several organizations viewed training as a means of being able to keep up with their competitors.

With regard to the organizational objectives to be met in offering training and retraining programs, all of the employer-based program managers indicated that maintaining or increasing worker productivity was a major objective to be met. Improvements in employee morale and a reduction

in labor costs were additional objectives. For the managers of the training organization-based programs, increasing the supply of skilled labor was the major objective. Since only three of the programs were specifically targeted to the training or retraining of persons over the age of 40, it would appear that concern for assisting the older worker in adapting to technological change was not a major factor considered in the development of these programs.

The program objectives cited by the managers were consistent with those identified in the literature. Hoos (1967), for example, concluded that the retraining programs she studied in the 1960s were created out of two motives: (1) the need to train newly hired personnel to equip them with the technical skills required by newly developed technology and (2) the need to update the skills of permanent employees affected by technological change in order to reduce turnover and attrition during good business conditions. The programs also reflected Warren's (1969) notion that training is designed to create changes in skills, knowledge or attitudes.

Factors Affecting Participation

Participation in the training and retraining programs was affected by factors associated with both the provider and the participants themselves. Eligibility requirements, e.g., job classification; satisfactory performance on a screening test; and recruitment strategies were the most common tools by which providers influenced who participated in a particular training endeavor. These factors were consistent with those identified anecdotally in the literature. While some demographic characteristics were used as targeting criteria in programs supported with public funds, age was not used as a formal eligibility requirement in any of the twelve case illustrations.

Eligibility criteria appeared to have the potential for both working for and against older workers. Years-of-service requirements, for example, might favor older workers who often have longer tenure on the job whereas the use of screening tests might disadvantage older workers whose education is less recent. None of the twelve providers perceived that their eligibility requirements did, in fact, penalize older workers. Some providers also noted that informal encouragement or discouragement was frequently used to guide individuals into or away from training opportunities. There was no indication that this kind of persuasion was more or less likely to be used with older participants than younger participants.

With regard to participant-based factors, managers felt that negative attitudes towards retraining such as resistance to new technology, apprehension about operating new machinery, and skepticism about the outcomes of retraining, might deter some middle-aged and older persons from participating in retraining programs. Although consistent with the little literature that exists on the subject, managers did not perceive the attitudes of older persons to differ substantially from those of younger people or to pose problems in implementing training and retraining programs.

Training Methods

In training participants, all twelve programs combined the use of lectures with either simulation and/or on-the-job training (OJT). Three of the providers also used programmed instruction. In most cases, training emphasis was placed on the simulation or on the OJT, not upon lecturing; the idea was to encourage as much "hands on" experience as possible. When the managers were asked why these particular methods had been selected, two responses were given: (1) the methods were believed to be best suited to the learning skills of the trainees, and (2) the methods were felt to best deliver the types of information to be learned in a manner easily related to by the trainees.

Eleven of the providers reported that none of the methods either posed problems or were more effective for older trainees than for younger trainees. One manager did report that older trainees were often less accepting of the lecture method and more responsive to practical applications of newly presented information. In two case illustrations, however, managers reported that their older participants liked the lecture method.

When asked if different methods of training or retraining were being used for different age groups of program participants, all twelve managers said "No". Two of the managers added that their companies did not consider age a factor in selecting training techniques. Moreover, some of the managers were surprised to learn that there was a body of literature on training methods for older workers.

Whether programs would have been even more successful if they had tailored their training techniques specifically for older workers could not, of course, be examined within the context of this study. Many of the programs did incorporate training methods identified in the literature as well suited for older learners. All, for example, supplemented lectures with simulation and/or OJT experiences, allowing older participants to "discover" the new technology as well as hear about it in the abstract.

Nevertheless, it is clear that providers did not perceive a need to train older workers any differently than younger participants and did not feel that older participants were disadvantaged by or could not perform well under the training methods that were used. The idea that older workers should be trained any differently than younger workers simply had not occurred to most managers and most did not see that age was, or could be, an issue.

Benefits from Training and Retraining

Managers of employer-based programs noted that the training programs benefited their organizations in a number of ways. Financial benefits included increased productivity, more efficient use of machinery and equipment by program participants, and an improvement in the quality of the goods and services produced by the participants. The managers of the training organization-based programs indicated that employers who used their services benefited from the development of in-house expertise in areas where there was none before and from the ability to immediately put to work newly hired employees who were equipped with skills specifically needed by the organization.

The discussion of financial benefits was tied directly to trainee age in the case illustration involving the retraining of engineers for digital technology. Management believed that it was more cost-effective to retrain their older engineers than to hire younger professionals with more current skills. In addition, three managers indicated that because older workers have an extensive knowledge of how to perform different jobs and of how organizations conduct business, when coupled with new skills, the older worker represents a potentially more valuable employee to a company than a trained younger person newly hired by the organization.

When asked about the benefits received by participants, managers perceived that non-financial benefits outweighed financial rewards. Non-financial benefits included improved morale, enhanced job security, greater job mobility, and improved job satisfaction. When financial rewards did occur, they came in the form of raises and increased opportunities for promotion.

Training Costs

With one exception, the entire cost of training was borne by the employer in the seven employer-based programs. The average cost per employee per year ranged from $68 to $13,000. For the training organizations, the average cost per trainee per year ranged from $51 to $2,800; funding sources varied and included the trainees themselves, employers, unions and government programs. The major cost categories included the salary and wages of the participants, instructor salaries, travel to outside organizations for special courses, equipment, materials and supplies, and overhead.

Costs did not vary by trainee age, sex, race, or educational background. When asked the qeustion "Is it more cost effective to train individuals at certain ages?" all but two of the organizatioans said "No." The two organizations that responded affirmatively indicated that it was more cost effective to train younger people than older persons, since the former were more likely to be employed with their firms longer than the latter.

In general, the managers indicated that their organization's training costs were tolerable because they were part of an overall investment strategy. And it appeared that the retooling of the older worker for changing technology was viewed as an investment equal to that of training a young person.

The Future

Most organizations indicated that their need for training would persist into the future since technology was expected to continue to change, and most planned to continue existing training programs, adapting them to meet new needs and new populations. Several providers indicated that, in the future, they would move to new models of training. These included train-the-trainer approaches, collaborations with community colleges and fee-for-service arrangements. Two providers stated that they would probably change the technology of training in the future, relying more on computers and interactive instruction. One of these providers felt

that this change might "scare" older workers who were less familiar than younger workers with computers. Similarly, one provider noted that greater involvement of junior and community colleges in future training could place older workers at a disadvantage since they were perceived to be apprehensive about going on campus and possibly threatened by a competetive educational environment.

The providers in the twelve case illustrations were generally unable to make suggestions for specific policy actions that government could take to encourage the training of older persons. Some providers felt that older individuals should not necessarily be singled out---training should be provided for workers of all ages.

While specific policy recommendations regarding training for older workers were rare, most providers did agree that it would be useful for government to fund training programs. Many also throught it would be useful if the government served as a source of information about training programs, perhaps acting as a clearinghouse. Some providers thought this kind of arrangement might help them avoid "reinventing the wheel" in designing specific training programs. There was little enthusiasm, however, for having government act as a coordinator of training programs.

Other recommendations for ways in which government could help ensure that America's workforce, generally, was trained to meet the challenge of changing technology paralleled those cited in the literature and included:

- Pass federal legislation to prohibit states from suspending Unemployment Insurance for persons enrolled in certified training programs;
- Broaden the definition of disadvantaged used to determine eligibility in federal employment and training programs;
- Provide funds to colleges and universities to purchase equipment for training laboratories;
- Reward employers who were doing effective training in conjunction with government contracts;
- Subsidize "industrial sabbaticals" for college professors so they could learn about the latest technologies;
- Restore participant subsidies in federal employment and training programs to ensure that participants have sufficient income to stay enrolled;
- Develop a "Displaced Workers' Bill of Rights" patterned after the G. I. Bill of Rights;

- Require workers receiving Unemployment Insurance to take training or receive UI at a reduced rate;

- Use age as a target for recruiting participants to federal employment and training programs.

In sum, it is clear from the literature and the twelve case illustrations that the need for technology-related training will increase in the future. Most providers expect to be able to meet their future training needs, employing new instructional technologies and forging new collaborative relationships where appropriate. Providers do not generally perceive age to be an issue in training and do not feel the need for special government assistance to train the older worker.

Conclusion

Generally speaking, it was found that there was congruence between the way in which training and retraining programs were discussed in the literature and the manner in which they are administered by the organizations studied in this project. This was less true, however, for the issue of training methods and for the attention given to the older trainee.

The methods of training described in the literature tended to be methods that have been used in laboratory settings to teach people new skills. They are methods that appear more useful in artificially-created environments than in industry-related situations. The organizations represented in the case illustrations used only a few of these methods. For the most part, training occurred on-the-job with experienced workers teaching trainees.

Overall, the literature discusses the older person as in need of special training (Barkin, 1970; Belbin, 1965; Belbin, 1970; Belbin & Belbin, 1970; and Belbin & Belbin, 1972). However, the vast majority of organizational representatives who were interviewed in the case studies could not relate to the need to train older persons any differently than young people. They clearly stated that their organizations train all workers the same way; management does not consider trainee age to be a factor in dictating how training is to be administered.

In sum, the employers and training organizations represented in the case illustrations rarely took into account the factors of trainee age or trainer age in designing and implementing their training and retraining programs. However, there was no evidence to suggest that older participants suffered from this. Older persons were described as performing as well as young individuals. And organizations in the case illustrations appeared to have as much interest in preparing mature workers and unemployed older people for changing technology as in preparing the young.

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CHART 1

Selected Case Illustration Characteristics

CASE #	TECHNOLOGY	TRAINING RATIONALE	TRAINING PATTERN	TRAINING PROVIDER	TARGETED PARTICIPANTS
#1	space shuttle	train entry level workers	pre-employment	employer	all ages
#2	numerically controlled machines	upgrade/update skills	post-employment	employer/ equipment manufacturer	older workers
#3	word processing	change attitudes	post-employment	for-profit contractor	older workers
#4	engineering	update skills/ reduce costs	post-employment	employer/ educational institution	older workers
#5	electronic office equipment	update skills	post-employment	employer	all ages
#6	aircraft manufacture	update/upgrade skills/train entry workers	post-employment	employer/ educational institutions	all ages
#7	robot maintenance & repair	supply skilled workers	post-employment	equipment manufacturer	all ages
#8	computer programming	upgrade skills	post-employment	educational iustitution	all ages
#9	computer assisted design	upgrade skills/ meet competition	post-employment	employer equipment manufacturer	all ages
#10	micro-electronics	supply skilled workers	pre-employment	non-profit contractor	all ages
#11	electronics/ welding	supply skilled workers	pre-employment	trade school	all ages
#12	electronic switching	upgrade skills	post-employment	employer	all ages

Appendix

Case Illustration 1

Two years ago, a large aerospace company began offering pre-employment training to unemployed persons of economically disadvantaged backgrounds. The objective of the program has been to train these individuals for jobs involving work on the thermal protection system of the space shuttle. This training was first provided as part of a pilot project funded by a Private Industry Council and was later incorporated into the technical training program of the company. Trainees receive on-the-job training by in-house personnel for a period of 3 to 5 weeks. Those successfully completing the program are hired by the organization, as jobs become available. While the company has sought to attract older people to the program, approximately only 15 to 20 percent of the participants are over the age of 40.

Case Illustration 2

A university-based nuclear defense laboratory has been retraining older machinists to work with new equipment since its creation in the 1960s. The numerically-controlled machinery of the lab is constantly being upgraded by manufacturers, requiring operators to keep up-to-date on how to use the new models. As changing technology requires the development of a more sophisticated machine by a manufacturer, a select number of senior machinists are sent to the factory to attend courses over a two-week period that describe and demonstrate the equipment's use. Upon returning to the lab, these factory-trained employees instruct the other machinists on how to operate the machines in small groups of 2 to 3 workers. Management considers this on-going retraining process to be a major job requirement of all journeyman-level machine operators.

Case Illustration 3

One year ago, a small company was created for the purpose of training business executives in the use of personal computers. The professionals who designed its services were led by the belief that older executives tend to feel threatened by the introduction of computers in their firms and are fearful of being outperformed on the job by younger, more computer-skilled coworkers. Consequently, the philosophy of this computer training company is that individuals such as chief executive officers and general managers should be introduced to microprocessor technology in an environment away from their offices that allows for private, individual instruction. Over 60 percent of the persons who have attended the company's workshops have been age 40 or older. Moreover, the staff has found that some executives who become convinced of the need for a computer in their work will later send their secretaries to the program.

Case Illustration 4

The electronic systems division of a multiconglomerate offers an in-plant retraining program to regularly upgrade and update the skills and knowledge of its engineers. This program was created out of the need to shift from analog to digital technology in the mid 1970s. Management was forced at that time to decide on whether to lay off older engineers who skills had become obsolete and hire more up-to-date staff or retrain its

active employees; retraining was believed to be the less expensive effort. In the beginning, the program was compulsory for long-service engineers and has since then become voluntary and open to engineers of all ages. Courses of a highly technical nature are offered in individual departments during the lunch period and immediately after working hours. The courses, which are announced in the staff newsletter, include lectures and laboratory work. Over 50 percent of the retrainees are over age 40. Management believes that this retraining is not only necessary to maintain worker productivity but also serves as an incentive for some retirement-age engineers to remain working with the company rather than elect early retirement. This latter concern has become an issue for management in recent years since it has been projected that 40 percent of the organization's workforce will be eligible to retire within the next ten years.

Case Illustration 5

A corporation manufacturing electronic office equipment created a training center where employees are sent for instruction on the use of its products. The center offers an "electronic literacy" program to workers who sell, operate, or service the equipment for client companies. The period of training ranges from 5 days to 3 to 4 weeks, depending on the need of the employees. At the center, workers are first provided with reading materials to study and are then engaged in job simulation experiences. Given that for many employees, promotions with the firm are directly tied to the utilization of training, as many older workers as young workers appear to use the center's services.

Case Illustration 6

An aircraft manufacturing corporation has been providing both voluntary and obligatory technical training opportunities for its personnel since the firm's beginning. Given that changes are continually being made in company procedures for building aircraft to keep up with competitors industry and to insure greater flight safety, two levels of training are available. Employees may elect to take evening courses on-site or at one of several community colleges in subject areas that would upgrade their job skills. In addition, workers who design or construct aircraft parts must take special courses to update their skills or to learn new ways of doing their work. Workers whose jobs must meet certain certification requirements are also obligated to take a required number of courses per year to pass certification audits. The company has found that young, entry-level workers are equipped with fewer job-related skills than was the case in the 1950s and 1960s. Consequently, older employees are sometimes used to assist in the on-the-job training of newly hired high school graduates.

Case Illustration 7

One of the country's largest manufacturers of industrial robots provides training in operations, repair, maintenance and programming to equipment purchasers' personnel. A limited amount of on-site training is included in the equipment purchase price; additional specialized training is provided on a fee-for-service basis either at the purchaser's location or at the robot manufacturer's facility. Training sessions vary from 1 day to 2 weeks and combine lecture and hands-on experiences. Two major

objectives are met in these training programs. First, the training ensures that the purchaser's in-house personnel can maintain, repair and program the robots and thereby avoid costly externally provided services. Second, the training familiarizes workers with safety considerations and, by reducing anxiety about the robot, enhances the morale of personnel working in the vicinity of the new equipment.

Case Illustration 8

A small company which hires retirees as consultants to provide contract computer programming services found that it needed to expand its programming language capability in order to stay competitive. Originally trained in cobol, the consultants sought training in basic and assembler languages. Since the company could not afford to provide training itself, consultants are urged to attend classes conducted at the local junior college. Those consultants who decide to take additional training typically attend two courses per language; classes meet four times a week for six weeks and involve both classroom and laboratory work.

In addition to expanding the market for the company's services, the training helps the company meet its goal of developing a cottage industry where consultants can work at home on their own micro-computers. The language basic, for example, is used in many software applications and basic programs can be written at home on a wide variety of micro-processors.

Case Illustration 9

Approximately two years ago a Computer Assisted Design (CAD) system was introduced into the design and mechanical support system of an aerospace firm. CAD is used to design parts and circuitry. After an informal screening, degreed engineers, non-degree designers and technicians were sent to the system manufacturer's facility for a two week training course which consisted primarily of hands-on use of the machine. Additional specialized courses offered by the manufacturer are taken as needed. In introducing the CAD system, the aerospace firm hoped to improve productivity and reduce labor costs, thereby making the firm more competetive in seeking contracts.

Contrary to the fears of some, the use of the CAD system has not resulted in the displacement of any current employees. In fact, additional employees have been added to the unit. New employees must, however, be familiar with the CAD system. Since the software and hardware of CAD systems are changing rapidly, the firm expects to have an on-going need for retraining.

Case Illustration 10

A shortage of trained personnel prompted five high technology firms on the West Coast to work with a local employment and training consortium to develop a micro-electronics training program. Using CETA funds as well as equipment, parts, and technical expertise donated by the five companies, a local non-profit training center provides entry-level training in micro-electronics processes including wafer fabrication and wire bonding. Training participants must meet CETA eligibility criteria and pass a series of hand/eye coordination and dexterity tests. Coursework consists of one

job readiness module and three technical modules. Once hired, trainees are typically provided additional, company specific training. Originally planned as a five year venture, the training program has been in operation for approximately one and one-half years.

Case Illustration 11

Under its Investment in People Program (IPP), the State of Californi matched union and automobile manufacturers' funds to provide retraining opportunities for unemployed auto workers. IPP funds were awarded through a request for proposal process to a trade technical college to train auto workers in entry level electronics, welding and diesel automotives. Depending on the program, trainees take from 14 to 24 units of college credit during a semester. Courses combine lectures and labs.

The primary objective of the program is to increase the supply of skilled labor. Additionally, the program allows the college to assist residents of the surrounding community, recover overhead costs, expand existing programs, and develop closer ties with business and industry. The first group of trainees graduated this spring; the college is seeking funding to continue the program.

Case Illustration 12

During the past seven years, a communications company has been converting its call switching operations from electro-mechanical to electronic. As a result of this change in switching technology, the company has developed a program to retrain its communications technicians. Those individuals who pass a screening test begin a series of courses which involve classroom training and field work. Training is conducted at a central facility where the electronic switching equipment has been installed to simulate a real job situation. The training program ensures that qualified individuals are available to operate the new switching system and helps the company meet its goal of avoiding displacement of existing workers. The program will continue until all electro-mechanical switching operations have been converted.